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XXV. *On the Chronology of the Hindoos.**By William Marfden, Esq. F. R. S. and A. S.*

Read June 24, 1790.

IT is my design to treat, in the following Paper, of the CHRONOLOGICAL ERAS in use among the people of Asia, called *Hindoos*, who profess in general the religion of *Brahma*, and are considered as the indigenous inhabitants of India. The elaborate researches into their recondite writings, made by those gentlemen who have applied themselves to the study of *San-skreet* literature, afford us ground to expect considerable discoveries in regard to the scientific attainments of this ancient and celebrated people. Their astronomy in particular has attracted the attention of the learned in Europe, who see in it the internal evidence of very remote antiquity, and are disposed to allow its pretensions to originality; many strong and unequivocal traces indicating that the Greek school at least derived more than the elements of their knowledge, by no very circuitous channel, from this oriental source.

Unfortunately for the gratification of rational curiosity, history seems to have been, of all branches of study, that which the Hindoos cultivated with the least care, and we regret to find the periods marked by the revolutions of the heavenly bodies, of which other nations have availed themselves to ascertain and record the important events in human

affairs,

affairs, by them unprofitably applied to the dreams of their mythology. The unremitted labour of ages has been devoted to perfecting the calculation of the lunar motions, in which their correctness is surpassed only by the European improvements of very modern times; but, by a strange perversion, the accuracy thence acquired in their prediction of eclipses, appears to have no other object than that of administering to an idle superstition, which it ought to destroy.

Although the *fabulous* exceedingly prevails in all the ancient documents hitherto introduced to our knowledge, and in none more conspicuously than those which contain the genealogies and reigns of their early kings (*a*)\*, yet we are not hastily to conclude, that this people are destitute of records of true history. The portion of their literary stores which we have had opportunity to examine is comparatively small. Perseverance may discover annals, more or less ancient, whose present obscurity is perhaps occasioned by that very circumstance which constitutes their real value — the want of the *miraculous*. Some authentic monuments have already been elucidated by the learned skill of a gentleman, now a Member of the Royal Society. Facts will accumulate by degrees, and acquire authority by mutually bearing on each other; and the Hindoos, like many other nations of the world, may hereafter be indebted to strangers, more enlightened by philosophy than themselves, for a rational history of their own country.

In different parts of India, and even in one and the same part, we observe various chronological eras referred to, as well in their astronomical treatises, as in their political and private writings. These being productive of confusion, if not clearly understood and discriminated, I shall endeavour to exhibit such a comparative statement of their respective commencements

\* See the Notes at the end of the Paper.

and coincidences as may tend to remove this impediment to the progress of historical knowledge. I am not aware that any attempt has hitherto been made in Europe, to bring them into one point of view; and as an opportunity is hereby given of correcting some errors that we have been led into by the sanction of respectable names, I am induced to think, that what I have undertaken will not be considered as superfluous.

My present purpose does not lead me to attempt a discussion of what may be termed the *fabtitious* periods of Hindoo computation, or to explain the nature and duration of the four ages, or *Yoggs*, which this speculative people, in the wanton exercise of numerical power, have portioned out from the boundless region of time. The three former of these divisions, even though the progressive numbers assigned to them should be admitted as the result of astronomical combination, can be presumed to have but little reference to practical chronology, which seems to trace its origin no higher than the commencement of the fourth, or present age, denominated the *Kalee Yoog*. This constitutes the principal era to which I would draw attention, and comprehends within it these that follow; the era of *Bikramajit*, the era of *Salabân*, the Bengal era (not strictly Hindoo), and the cycle of sixty years.

Before I proceed to a comparison of their several dates, it will be proper to define the nature of the year and its constituent parts, according to which these eras are computed by the *Brahmans*, who are the depositaries of science as well as of religion. Their astronomical year is the measure of that portion of time which is employed in a revolution of the sun, from the moment of his departure from a certain star in their zodiac, as seen from the earth, till his return to the same. It is therefore solar and sydereal, and contains, by their calculation,

365 d. 6 h. 12' 30''; and as they suppose the annual movement of the stars in longitude, or the precession of the equinoxes, to be 54 seconds of a degree, or 21' 36'' of time (admitting, with them, the sun to move at the rate of a degree each day), their tropical year will be 365 d. 5 h. 50' 54'' (b): but as the sun really moves over 54'' in 21' 55'', its length is strictly 365 d. 5 h. 50' 35'', or 1' 52'' greater than the tropical year as determined by MAYER at 365 d. 5 h. 48' 43''. The true precession being 50'',<sub>3</sub> which space the sun describes in 20' 25'', the true sydereal year is 365 d. 6 h. 9' 8'', and consequently the Hindoo year exceeds it by 3' 22'', or one day in 430 years. If the opinion of astronomers is well founded, that a sensible diminution in the length of the year, as well as in the angle of obliquity of the ecliptic, has gradually taken place in the lapse of many ages, it will follow, that this error may not have existed, or been so great, at the period of adjusting the Hindoo tables: and when we consider that there appears no ground to believe their apparatus for observing was ever much superior to what it is discovered amongst the Brahmans of this day (c), we are led to wonder at the precision attained to in this determination, and which, in the calculation of the moon's apogee, is still more remarkable. The defect of art can have been compensated only by the remote antiquity in which the series of their observations originated, affording an opportunity of correcting the inaccuracy of particular measurements by a mean of large numbers and distant intervals.

They divide the zodiac into twenty-eight lunar and into twelve solar constellations or signs (d), and their astronomical year commences with the sun's arriving at the first point of their constellation of *Aries*. This division of the zodiac, so far as the accuracy of their observations allows, is connected

with the actual phænomena of the heavens, and advances with the apparent motion of the stars, from east to west, leaving gradually behind it the equinoctial points, and is not, like our zodiac, an abstract division of space, attached to those points, and independent of the starry system. Calculating on their principles, the difference of the two zodiacs, or the accumulated amount of the annual precession, since the coincidence supposed to be in the year of the Christian era 499, is in the the present year  $19^{\circ} 21' 54''$ .

The length of their months is determined by the time which the sun employs in passing each sign, and they are accordingly longer in the *apogee*, and shorter in the *perigee*; that which corresponds with the higher *apsis* being 31 d. 14 h. 39', and that with the lower 29 d. 8 h. 21' only. It does not appear, that the Hindoos are accustomed to enumerate, for civil purposes, the days of the solar month, but to date from the age of the moon that happens to fall within that month, or frequently from the simple phase of the moon (*e*).

Their festivals and fasts, like those of the Jews and Christians, being regulated, for the most part, by the lunar revolutions, they employ on this account, exclusively of the solar, astronomical reckoning, a lunar year (*f*). This they make to consist ordinarily of twelve months, and each semi-lunation is distinguished into fifteen equal portions, or lunar days, which are somewhat shorter than the natural day. In order to preserve its general correspondence with the solar year, "they reckon "twice that lunation during which the sun does not enter upon "any new sign" (*g*), or, in other words, which falls completely within a solar month; and the obvious reason for this mode of intercalating is, that as the lunar months take their denomination from the solar month in which the *change* happens, if two new  
moons

moons fall within the same month, they naturally take the same name, and no irregularity is observable. This opportunity of encreasing the number of lunar months, without embarrassing the reckoning, presents itself, on a medium of a few years, just as often as is requisite to effect the compensation. It cannot happen in all the solar months indifferently, their lengths being unequal, and some of them shorter than the synodical lunar month.

The commencement of the solar day is usually estimated from sunrise, and the space between that and the sunrise of the following day is divided into *sixty* parts, the length of which must vary with the sun's unequal course through the ecliptic; but for the purposes of calculation it is supposed to be ascertained at the solstices, and is equal to twenty-four of our minutes. The subdivisions, in like manner, follow the sexagesimal scale. There is also a mechanical division of the day and night into *eight* parts, of which four are allowed to the interval from sunrise to sunset, and four to that from sunset to sunrise. The proportion of length of these parts respectively depends therefore upon the season of the year and the latitude of the place, and the division is consequently inapplicable to general astronomy.

The days of the week are denominated from the seven planets, and their arrangement is the same with that adopted in the western parts of the world, proceeding from the sun and moon to Mars, Mercury, Jupiter, Venus, and Saturn (*b*). Friday, or the day of Venus, appears as the first of the week in their calculations, and probably because the *Kalee Yoog* began on that day; but, in common, the week is considered by the Hindoos as beginning with Sunday.

Having

Having thus briefly touched upon such points of their astronomy as are immediately connected with the measurement of time, I proceed to the comparison of their *eras*, which I shall first bring into one general view, and afterwards consider separately.

Table exhibiting the correspondence of the several *Hindoo eras* with each other, and with the Julian period and Christian era.

	Julian period.	<i>Kalee Yooq.</i>	Era of <i>Bikramajit.</i>	Christian era.	Era of <i>Salabân</i>	Bengal era.	Cycle of 60 years.
<i>Kalee Yooq.</i> , or grand era . . . . .	1612	0					13
Era of <i>Bikramajit</i> .	4657	3045	0				58
Christian era . . .	4713	3101	56	0			54
Era of <i>Salabân</i> .	4791	3179	134	78	0		11
Present cycle of 60 years . . . . .	6460	4848	1803	1747	1669	1154	1
Year 1790 of J. C. (from April) .	6503	4891	1846	1790	1712	1197	44

For better understanding the above table, it is necessary to remark, that when the Hindoos quote the year of an era, they do it by the number of the elapsed or complete year; whereas, the common European mode is to date by the number of the current or incomplete year; therefore what we should term the first year of an era, is with them the year *zero*, and their year *one* that which follows; excepting in the cycle of sixty, of which the year *one* immediately succeeds the last complete year of the former cycle. The difference in years between any two eras is expressed by the number appearing at the intersection of the horizontal and perpendicular lines, to which the

names



names of such eras are prefixed; or it may be found by subtracting the lesser number from the greater, as they stand in any of the horizontal lines, under their respective names at the top of the perpendicular columns; thus, the years intervening between the era of *Salabân*, and that of the *Kalee Yooç*, are denoted by the number 3179, at the intersection of the two lines, or equally by deducting 1712 from 4891, in the lowest horizontal line.

In a comparison of the dates of the earlier Hindoo eras with the Christian era, there occurs a difficulty which it is proper to consider apart. This arises from an ambiguity in our manner of reckoning the years before Christ. It is most usual to pass immediately from the year *one after* to the year *one before* Christ, making the interval of time only one year; but some of the best chronologists pass from the year *one after* to the year *zero*, and from thence to the year *one before*; by which means the interval between any number of years before and after Christ is equal to the sum of those numbers; and as this method is used in almost all astronomical tables, it may, without impropriety, be called the *astronomical*, and the other the *common* method. The following rules will facilitate the reduction of the several Hindoo years to those of the Christian era, and to the years before it.

To find the year of Christ corresponding with a given date of the	$\left\{ \begin{array}{l} \text{Kalee Yooç,} \\ \text{E. of Bikra-} \\ \text{majit,} \\ \text{E. of Salabân,} \\ \text{Bengal era,} \\ \text{Present cycle,} \\ \text{of 60 years,} \\ \text{Ensuing cy-} \\ \text{cle,} \end{array} \right\}$	when the date is posterior to our era,	$\left\{ \begin{array}{l} \text{subtr.} \\ \text{add} \end{array} \right\}$	$\left\{ \begin{array}{l} 3101 \\ 56 \\ 78 \\ 593 \\ 1746 \\ 1806 \end{array} \right\}$	$\left\{ \begin{array}{l} \text{from it.} \\ \text{to it.} \end{array} \right\}$

But

But when the date is prior to our era, subtract the

year of	{	Kalee Yoog from	{	3 <sup>102</sup> for <i>common</i> method.
				3 <sup>101</sup> for <i>astronomical</i> method.
		Bikramajit from	{	57 for <i>common</i> method.
				56 for <i>astronomical</i> method.

As the Hindoo year begins in our month of April (which will be particularly explained), we must observe, in reducing any Hindoo date to the Christian era, that when it happens between the commencement of our year and theirs, the number of their year must be increased by one, and the subtraction or addition then made as above directed.

The *Kalee Yoog*, or principal chronological era, began in the year just specified, when the sun's mean place was in the first point of the constellation *Aries* of the Hindoo zodiac; which happened on the 18th of February, at sunrise (*i*), under their first meridian, called the meridian of *Lanka*. At that period, it is said to be asserted by their astronomers, that the sun, moon, and all the planets, were in conjunction, according to their mean places. The reality of this fact, but with considerable modification, has received a respectable sanction from the writings of an ingenious and celebrated Member of the French Academy of Sciences, who concludes, that the actual observation of this rare phænomenon, by the Hindoos of that day, was the occasion of its establishment as an astronomical epoch (*k*). Although M. BAILLY has supported this opinion with his usual powers of reasoning, and although abundant circumstances tend to prove their early skill in this science, and some parts of the mathematics connected with it (*l*), yet we are constrained to question the verity or possibility of the observation, and to conclude rather that the supposed conjunction was, at a later period, sought for as an epoch,

epoch, and calculated retrospectively. That it was widely miscalculated too, is sufficiently evident from the computation which M. BAILLY himself has given of the longitudes of the planets at that time, when there was a difference of no less than  $73^{\circ}$  between the places of Mercury and Venus. But fifteen days after, when the sun and moon were in opposition, and the planets far enough from the sun to be visible, he computes that all, excepting Venus, were comprehended within a space of  $17^{\circ}$ ; and on this he grounds his supposition of an actual observation.

Calculating from the rules laid down by the Brahmans (as given by M. LE GENTIL), it appears, that 4891 mean years of this era expired on Monday, 12th April, 1790, at  $4\frac{1}{2}$  h. and that the true place of the sun came to the first of Aries, and consequently that the 4892d year (or 4891 complete, as the Hindoos express it) actually began on the 10th, at 1 h., or on Sunday, 11th April, in their civil way of reckoning (*m*). Thus we see that, during this long period of time, the Hindoo account has lost upon the Julian 42 days, allowing for the change that took place in our style. The year of the former exceeding the latter by  $12' 30''$ , falls continually later and later on our old style year, at the rate of a day in about 115 years; and from this the commencement of any future year may be readily computed. The annual irregularity observable, which is independent of this almost imperceptible change, arises only from our mode of intercalating a day at the end of every fourth year, to compensate the fractions that have accumulated during that time. The Hindoo astronomical year, admitting of no intercalation, cannot preserve an annual correspondence, but began at nearly the same time, with respect to our year, in 1786 as in 1790; in 1775

and 1787, six hours later; in 1781 and 1785, six hours sooner; and in 1784 and 1788 (being leap years) eighteen hours sooner than in 1787. The civil year begins at the sunrise immediately preceding the calculated commencement of the astronomical, when that happens during the day; but if in the night time, it begins at the sunrise following, and will consist of 366 days so often as the excess of the astronomical year above 365 amounts to a whole day.

The next era that presents itself, and the first that has pretensions to be considered as historical, is that of *Bikramajit* (*n*). This prince, whose paternal kingdom was *Malwa*, and his capital *Ougein*, waged war against *Saka* king of *Debli*, probably his lord paramount, and having overcome and slain him, ascended in his stead the principal throne of India. Authorities differ widely as to the length of his reign (*o*); but he likewise is said to have fallen in battle, fighting with a king who invaded him from the southern provinces. He appears, from this account, in no other light than that of an unfortunate usurper, yet his fame in the memory of the Hindoos has eclipsed that of his predecessors, his adventures are a favourite subject of romance, and an era has been distinguished by his name. It is doubted, whether we ought to consider his accession, or his death, as constituting the proper epoch; but with regard to the time from which the reckoning dates there is no uncertainty, and the nature of the event is not essentially connected with our present object. It is placed in the year 56 before Christ, or in the 4657th of the Julian period, and corresponds with the 3045th year of the grand era (*p*).

I had occasion to remark, when treating of the *Hejerà*, that this Mahometan era was computed, not from the day of the Prophet's flight, as generally supposed, but from the ordinary

commencement of that year in which the flight happened (*q*); and thus we find, on comparing the Hindoo eras, that though some of them are professed to be counted from the deaths of their kings or other historical events, they yet all begin from the same point of the sun's annual course through the zodiac. The numerical reckoning of the years can well be conceived more liable to arbitrary change, as being less interesting to the bulk of the people, than the observance of a particular day, whose periodical return is every where marked with popular ceremonies and superstitions.

The era to which *Salabân* has given name dates from the 78th year of Christ, or 4791st of the Julian period, commencing with the 3179th year of the grand era. As this is no less than 134 years later than that of *Bikramajit*, it seems a bold anachronism to make them cotemporaries, or to suppose, what is commonly asserted, that the one prince was the conqueror of the other (*r*). Fortunately for my present investigation, it is history rather than chronology which suffers from this want of accuracy or discrimination in the annalists of India, or their Persian translators. *Salabân*, who is said to have reigned many years over the ancient kingdom of *Narînga*, in the northern part of the peninsula, is described as a liberal encourager of the sciences. There is reason to think, that astronomy experienced a reformation and considerable improvements under his auspices; and the professors appear to have attached the celebrity of an era to his death, in respect for his talents and gratitude for his protection.

As the era of *Bikramajit* prevails chiefly in the higher or northern provinces of India, so does that of *Salabân* in the southern, but more exclusively. In their current transactions, however, the inhabitants of the peninsula employ a mode of

computation of a different nature, which, though not unknown in other parts of the world, is confined to these people amongst the Hindoos. This is a cycle, or revolving period, of sixty solar years, which has no further correspondence with the eras above mentioned than that of their years respectively commencing on the same day. Those that constitute the cycle, instead of being numerically counted, are distinguished from each other by appropriate names, which, in their epistles, bills, and the like, are inserted as dates, with the months, and perhaps the age of the moon annexed; but, in their writings of importance and record, the year of *Salabán* (often called the *Saka* year) is super-added; and this is the more essential, as I do not find it customary to number the cycles by any progressive reckoning (*s*). In their astronomical calculations, we observe, that they sometimes compute the year of their era by multiplying the number of cycles elapsed, and adding the complement of the cycle in which it commenced, as well as the years of the current cycle; but from hence we are led to no satisfactory conclusion respecting the origin of this popular mode of estimating time (*t*). The presumption is in favour of its being more ancient than their historical epochs. The present cycle, of which 43 complete years were expired in April 1790, began in the year 1747, with the year of *Salabán* 1669, and of the grand era 4848. M. LE GENTIL, to whom Europe is chiefly indebted for what is known of Hindoo astronomy, has fallen into an unaccountable error with regard to the years of this cycle, and their correspondence with those of the Kalee Yoog, as appears by the comparative table he has given of them, and other passages of his work. He seems to have taken it for granted, without due examination, that the year 3600 of the latter must have been produced by the multiplication of the

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the cycle of sixty into itself, and consequently that the first year of this grand era must also have been the first of the cycle; but this is totally inconsistent with the fact; the Kalee Yoog began with the 13th year of the cycle of sixty, and all the reasoning founded on the self-production and harmony of these periods must fall to the ground (*u*).

It now remains to take notice of a mode of reckoning peculiar to the province of *Bengal*, and thence denominated the *Bengal* era. The circumstances of its institution are involved in obscurity, and I do not find that even a conjecture on the subject has yet been offered to the world. It is admitted, however, to have been imposed by the Mahometan conquerors, and is therefore of no very remote antiquity. The most obvious consideration that presents itself, in examining the date of this era, is its proximity to the year of the Hejerà; the Bengal year 1196 complete ending on the 10th April, 1790, and the Hejerà year 1204 on the 10th September following. The difference has plainly arisen from the inequality of the solar and lunar reckonings, and its accumulation since a certain period when they must of necessity have coincided; and it is no improbable supposition, that the time of such coincidence was also that of introducing the mode of computation which has since prevailed. By ascertaining the amount of this difference, and the number of years required to produce it, we may expect to arrive at a knowledge of the period in question, or to approximate it at least. As the Hindoos compute from the elapsed year, and the Mahometans by the current, the difference between the two dates should be six years and seven months; but as this correction of one year may be presumed equally applicable at the supposed time of the coincidence, and therefore unnecessary in this instance, it will follow that the real  
difference

difference should be found by a simple subtraction of one date from the other, and consequently be seven years and seven months. The annual excess of the Hindoo or sydereal year above the Mahometan or lunar being 10 d. 21½ h., an interval of 254 years is required to produce this difference, or 220 years, to produce that of six years and seven months. The former number being deducted from 1790, carries us back to the year 1536, in the reign of the Mogul emperor *Humaioon*, and the latter to 1570, in that of *Akbar*. About one or other of these periods we should seek for some record of the institution, but the histories we possess throw no light upon the subject. Several gentlemen, conversant in the affairs of Bengal, to whom I have referred it, confirm the general idea as above given, but disagree as to the political circumstances. By one, the regulation is ascribed to *Sheer Shah*, who wrested the empire from *Humaioon*, and governed it for some years with wisdom and energy, when his death, and the distractions that ensued, restored it to the former possessor; and, by another authority, to *Akbar*, deservedly named the Great, who was next in succession.

The most obvious way of accounting for the peculiar mixture of Hindoo and Mahometan observances in this reckoning, appears to be, that the zeal of the monarch for establishing the era of his prophet had effected only a partial or temporary innovation; and that his new subjects, who were constrained to adopt as an epoch that year of the Hejerà in which the royal edict bore date, could not ultimately be forced to change their accustomed solar year for one that rapidly inverted the order of the seasons. But this attempt must be referred to a period somewhat earlier than the reigns of these particular princes, which were distinguished by a liberal policy; and the gentlemen



gentlemen above alluded to attribute to them respectively, not the interdiction but the *restitution* of the solar reckoning; that of the Mahometans, imposed on the province by their more bigotted predecessors, being found inconsistent with the periodical collection of the revenue, which depends on the harvests (v). It is, in truth, extremely difficult to conceive, how a mode of computation, so much at variance with the rational concerns of civilized people, can possibly subsist in any state of society above that of the pastoral and predatory tribes with whom it originated.

As it appears, that the people of *Siam*, in the farther India, have borrowed their knowledge of astronomy from the Hindoos, it will not be thought inconsistent with the subject I am treating, to add some account of the chronological eras in use amongst them. Of these, one has been termed their civil, and another their astronomical era. The civil reckoning is by lunar years, consisting ordinarily of 12 months each, with an intercalation of 7 months in the period of 19 years, and commencing with the new moon that precedes the winter solstice. This era is computed from the supposed time of the introduction of their religion by *Sommona-codom*, 544 years before Christ, or in the year of the Julian period 4169; and consequently 2333 years of it were expired in the month of December, 1789; but by a custom which, though not without its parallel, wants to be satisfactorily explained, they do not change the date, or count the succeeding year 2334, till it meets the astronomical reckoning in the month of April following.

The astronomical era is founded immediately upon the tables and modes of calculation adopted from the Hindoos. The French astronomer, DOM. CASSINI, by an ingenious deduction  
from

from no very circumstantial *data*, inferred that it must have had for its epoch a mean conjunction of the sun and moon, which happened on 21st March, 638 of the Christian era. This preceded by a few hours the commencement of the established Hindoo year, to which it was evidently meant to be accommodated, though it is by him referred to the vernal equinox, which took place two days earlier (*w*). The length of the Siamese solar year he found to be 365 d. 6 h. 12' 36'' (*x*), and consequently 1152 years of the era should expire on the 11th April, 1790, when the sun enters the Indian zodiac, being 560 years later than the era of *Salabán*. For want of corroborating facts, this determination of an epoch by M. CASSINI was considered as speculative and uncertain; but I am accidentally in possession of a date, which, though not precise, may serve generally to authenticate it. "In 1769, the king of *Pegu* (a country bordering on *Siam*, and formerly conquered by it) dates his letter to the French at Pondicherry, the 12th of the month *Kchong* 1132." This makes 1790 to correspond with 1153 instead of 1152; but when we consider the vague manner in which notices of this kind are given, a difference of one year can scarcely be urged as an objection.

The Siamese were also accustomed to make use of a cycle of sixty years, expressed by a repetition of twelve names of certain animals, which, I observe, are for the most part the same with those employed, for the same purpose, by the Chinese and Mogul Tartars, from whom we may conclude it has been borrowed (*y*); but the meager and unsatisfactory examples of its application, furnished by M. LOUBERE and P. TACHARD, do not afford us the means of determining at what time they began to reckon their cycle. It appears only that the

year 1687 was the tenth of the lesser or constituent cycle of twelve years (z).

In the foregoing account of the Indian eras, I am sensible that I have omitted many circumstances, the detail of which, if accurately given, might be useful and interesting; but at this distance from the countries where those eras are employed, the means of information are limited, and particularly with respect to the variations prevailing in the different provinces of what was formerly the Mogul empire. Unfurnished myself with local knowledge, my objects have been to compare and reconcile the information already given to the world with the experience of persons who have resided in Hindostan, and to correct and substantiate the whole by bringing it to the test of modern accuracy in the science of astronomy. In fulfilling the last especially I confess myself under obligations for essential assistance.

## N O T E S.

(a) See the French translation of the *Bhagavat*, under the title of *Bagavadam* ou *Doctrine divine*, p. 187. et seq. Compare also the lists of ancient kings of *Debli*, in BERNOULLI, Description de l'Inde, Vol. I. p. 153. (from P. TIEFFENTHALER), and Vol. II. p. xxxix. (by M. ANQ. DU PERRON); in the former of which a celebrated *Rajah* is made to reign 90 years, and in the latter no more than 3 years.

(b) M. LE GENTIL, Voyage dans les Mers de l'Inde, Vol. I. p. 231. According to the Hindoo Treatise of Astronomy, called the *Soorya Seedbanta* (of which I have seen some translated extracts), the length of the sydercal year is 365 d. 6 h. 12' 36'' 33''' 36''''', or about 6''½ longer than that given by M. LE GENTIL.

(c) Phil. Transf. Vol. LXVII. p. 598. see an account, by Sir ROBERT BARKER, of the Observatory at *Benares*; and in BERNOULLI, Vol. I. p. 316. and 347. (from TIEFFENTHALER) of those at *Jépour* and *Ougein*, constructed by *Rajah Jéfung*, in the present century.

(d) The Hindoo names of the solar signs, and of the months with which they correspond, as also of the lunar constellations or mansions, are as follows:

## Solar Signs.

## Months.

1 <i>Mēsh</i>	<i>Biṣāk</i> or <i>Viṣāk</i> *	April
2 <i>Breesb</i> or <i>Vreesb</i>	<i>Jeat</i> or <i>Jēsht</i>	May
3 <i>Meetoon</i>	<i>Āṣār</i>	June
4 <i>Karkat</i>	<i>Sāwan</i> or <i>Srāwan</i>	July
5 <i>Seengb</i>	<i>Bhādoon</i>	August
6 <i>Kanyā</i>	<i>Āsan</i>	September
7 <i>Toolā</i>	<i>Kārtēek</i>	October
8 <i>Vreescheek</i>	<i>Agban</i> or <i>Agraban</i>	November
9 <i>Dhanoo</i>	<i>Pooṣb</i> or <i>Powṣb</i>	December
10 <i>Makar</i>	<i>Māg</i>	January
11 <i>Koombba</i>	<i>Phāgan</i> or <i>Phalgoon</i>	February
12 <i>Meen</i>	<i>Chit</i> or <i>Chitr</i>	March

According to the foregoing list, the Hindoo year begins with *Biṣāk* (answering to April from about the 10th of that month); and for this arrangement I have the authority of three almanacs, published at Calcutta, for different years, and by different persons, as well as that of Mr. HALHED's translation of a Code of Gentoo Laws, p. 24.; yet I observe that M. LE GENTIL, ABRAHAM ROGER, BESCHIUS, WALTHERUS, and all the missionaries, agree in placing the month

\* The former is the common *Hindoostanee*, the latter the *Sanskreet* orthography: for both I am indebted to Mr. WALKINS.

*Chitr*, or *Chitr*, at the head of the year (instead of the conclusion), and making it to correspond with April. I can no way reconcile this incongruity, and only remark, that all the authorities for the one practice are from Bengal, and all those for the other from the peninsula of India.

Lunar Constellations.

1 <i>Ashweenee</i>	15 <i>Swātee</i>
2 <i>Bharanee</i>	16 <i>Veeṣakbā</i>
3 <i>Kreetteekā</i>	17 <i>Anooradbā</i>
4 <i>Roheenee</i>	18 <i>Jyēṣṭhā</i>
5 <i>Mreegafesra</i>	19 <i>Moola</i>
6 <i>Adree</i>	20 <i>Poorvāṣṭhārā</i>
7 <i>Poonarvasoo</i>	21 <i>Oottarāṣṭhārā</i>
8 <i>Pooṣṭhṛvā</i>	22 <i>Abheejeet</i>
9 <i>Aṣṭṛēṣṭhā</i>	23 <i>Sravana</i>
10 <i>Magha</i>	24 <i>Dhaneeṣṭhā</i>
11 <i>Poorva-phālgoonee</i>	25 <i>Satabheepā</i>
12 <i>Oottara-phālgoonee</i>	26 <i>Poorva-bhādrapad</i>
13 <i>Haṣṭā</i>	27 <i>Oottara-bhādrapad</i>
14 <i>Cheetrā</i>	28 <i>Rēvatee</i>

The number of the lunar constellations is more usually stated as amounting to twenty-seven only; and that which in the above list appears as the twenty-second, is said (in the *Ayeen Akbery*) to have been formed out of those contiguous, for some particular purpose. As the moon's periodical revolution is performed in 27 days and part of the 28th, it is not surprising that this ambiguity with respect to the division of the zodiac should exist.

(e) Thus they say, “on the *full moon* in the (solar) month *Bhādoon*,” “on the moon's increase in the month *Sāwan*,” “on the first day of the *bright half* of the month *Bijāk*.” It is to be observed, that they term the semi-lunation from the change to the full, the *bright half* of the moon, because it is above the horizon during those hours wherein it is likely to be visible. From the full to the change is called the *obscure half*; because, during the latter part, it does not rise till the hours of rest. See BESCHIUUS, Gram. Lat. Tam. p. 167. and Mr. WILKINS, Heetōpadēs, Note 70. to p. 43.

(f) These lunar years do not appear to be ever taken collectively, or regarded in computations of time; and the months of which they consist may not improperly be considered as a lunar division of the solar year.

(g) P. DU CHAMP (BAILLY, *Traité de l'Astronomie Indienne*, p. 320.).

(b) This arrangement of the names of the days, so different from the order of the planets, is ingeniously accounted for by COSTARD, in his History of Astronomy, p. 156. from the astrological appropriation of a planet to each of the 24 hours; but the reasoning applies rather more directly to the Indian division of the day into sixty parts or hours. If we suppose, for example, that the sun is made to preside over the first hour of Sunday, Mars over the second, Jupiter over the third, &c. in their natural order, we shall find the moon to answer to the first hour of Monday, Mars to the first of Tuesday, and so of the rest. To make the rule apply to the European division, we must reverse the order, and reckon downwards from the sun to Venus, Mercury, and the moon. The Hindoo names for the days of the week are properly as follows, though from the variety of appellations given to the planets, and particularly to the sun and moon, they are sometimes differently called.

<i>Adetya-</i>	} -vara	Sunday	Solis dies
<i>Ravee-</i>			
<i>Soorya-</i>			
<i>Chandra-</i>	} -vara	Monday	Lunæ
<i>Sōma-</i>			
<i>Mangala-</i>	vara	Tuesday	Martis
<i>Booddha-</i>	vara	Wednesday	Mercurii
<i>Vreehaspatee-</i>	vara	Thursday	Jovis
<i>Sookra</i>	vara	Friday	Veneris
<i>Sannee-</i>	vara	Saturday	Saturni

(i) At sunrise, according to M. LE GENTIL and others; but according to the *Soorya-Seedbanta* (before quoted), it is said to have begun immediately after midnight. This treatise estimates also the diurnal revolutions from midnight, if we may credit the *Ayeen Akbery*, Vol. III. p. 14.

(k) “Les Indiens disent qu’à l’instant du *Caliongam* il y a eu une conjonction generale de toutes les planètes; leurs tables en effet indiquent cette conjonction, et les nôtres montrent qu’elle a pu réellement avoir lieu.” *Traité de l’Astron. Ind.* p. xxviii. “Le témoignage des Brames est ici appuyé sur nos tables; et ce témoignage, qui n’a pu être fondé sur un calcul, doit être dû à une observation réelle,” p. 184.

(l) They frequently extract the square root, apply the proposition which is the 47th of EUCLID, and appear to have no mean knowledge of spherical trigonometry.

(m) The commencement of the *Kalee-Yoog* being calculated by the Hindoos according to the sun’s mean place, and the ordinary commencement of their years, according

according to his *true* place, it becomes necessary, when they compute the time elapsed from the beginning of their era, until that of any given year, to allow for the difference between the mean and true places at the former period, and on this account they deduct 2 d. 3 h. 32' 30" from the whole number of days.

(n) This is the common mode of spelling the name after the Persian; according to the Sanhkreet orthography, it should be *Veekramadeetya*. The place of his birth is said to be *Toumma-naggee*, in the north-eastern part of *Makwa*. Prior to the era of *Bikramajit*, the Hindoos appear to have reckoned by that of *Judishter* (or *Toodbe-shteera*), a king supposed to have reigned at *Hastinapoor* about the commencement of the *Kalee-Yoog*. Of this era 3044 years are said to have expired when the new reckoning was adopted; but the date is no other than that of the *Kalee-Yoog* itself, with the 3045th of which, as is seen by the table, the era of *Bikramajit* commenced. The translation of the *Benares Pattra* makes the year of *Judishter*, 3044, to correspond with the year 1784 of the Christian era.

(o) See (a), latter part.

(p) The copper plate discovered at *Mongueer*, and translated by Mr. WILKINS (*Asiatic Researches*, Vol. I. p. 123), is dated in the 33d year of an era supposed to be that of *Bikramajit*, who is alluded to in the inscription by an epithet signifying the *foe of Sakā*. For other ancient dates of this era, see *Asiatic Researches*, p. 287. and 380. M. BAILLY (*Traité de l'Afr. Ind.* p. cxxx.), quoting the authority of M. ANQ. DU PERRON, places it 54 instead of 56 years before Christ.

(q) Phil. Transf. Vol. LXXVIII. p. 416.

(r) Take the two following passages as instances. “*Bikermajit* ruled for some time over the northern parts of the *Deccan*; but the *Rajabs*, headed by *Salaban*, having revolted, they gave him battle, and he was slain.” F. WILFORD, *Asiat. Ref.* p. 374. “*Bikarmadjit* tint sa cour à *Oudjen*; c'est à lui que commence l'ère Indienne. Il fut vaincu et tué dans une bataille par *Salbbân* roi *Patane*.” BERNOLLI (P. TIEFFENTHALER), Vol. I. p. 357. The confusion arising from this anachronism is increased by an ambiguity of names; for that of *Sakā* or *Sak*, which belonged to the predecessor of *Bikramajit*, is likewise a name by which *Salabân* is commonly known, and from which his era is called the *Sak-âbda*.

For the relative date of the era of *Bikramajit*, I have the authority of Mr. WILKINS (*Asiat. Ref.* Vol. I. p. 130.), who makes 1837 correspond with 4882 of the *Kalee-Yoog*, and with 1703 of *Salabân*. These are corroborated in a manner that puts their accuracy out of dispute.

(s) The manner of dating appears thus in a grant of land, of which a translation is given in the *Asiatic Researches*, Vol. I. p. 363. “On the fifteenth of the

the bright moon of *Cartica*, in the middle of the year *Pingala*, when nine hundred and forty years, save one, are reckoned as past from the time of king *Sāca*, or in figures, the year 939, the moon being then full and eclipsed."

The names by which the years of the cycle are distinguished, and of which the significations relate to the sun, as having a good or evil influence, or to the year, as being more or less lucky, are as follows :

1 Prabhava	21 Sarvajeet	41 Plavanga
2 Veebhava	22 Sarvadharee	42 Keelaka
3 Sookla	23 Veerooddhee	43 Sowmya
4 Parama- <i>vyōtee</i>	24 Veekreetee	44 Sādhārana
5 Projōtpatee	25 Kara	45 Veerōdhakreet
6 Anggeerafa	26 Nandana	46 Pareetāpee
7 Sree-mookha	27 Veeshya	47 Pramadeechā
8 Bhava	28 Jaya	48 Ānanda
9 Yoova	29 Manmatha	49 Rakshafa
10 Dhātoo	30 Doormookha	50 Nala
11 Eefwara	31 Aveelambee	51 Peengala
12 Bahoodhānya	32 Veelambee	52 Kala-yooktee
13 Pramadee	33 Veekāree	53 Sceddhārthee
14 Veekrama	34 Servaree	54 Rowdree
15 Veehoo	35 Plava	55 Doormatee
16 Cheetrabhānoo	36 Soobha-kreet	56 Doondoobhee
17 Soobhānoo	37 Sōbhā-kreet	57 Roodrādheekāree
18 Tarana	38 Krōdhee	58 Raktākshee
19 Pārtheeva	39 Veefwavafoo	59 Krodhana
20 Vyaya	40 Parābhava	60 Akshaya

(*t*) At the commencement of the era of *Salabān*, 49 years were wanting to complete the current cycle ; and, in calculations where it is necessary to adjust the two reckonings, this number must be attended to ; but as the object to be known is not the number of cycles, but the number of the year of an individual cycle, or the corresponding year of the era, it is indifferent whether in their additions and subtractions they make use of 49 years simply, or of 49 added to one or more integral cycles, as 109, 349, or 409, which produce the same result. This accounts for the difference of practice remarked by M. BAILLY (p. 51.) in the Brahmins of different cities, and it seems to have no relation to the origin of the cycle.

(*u*) M. LE GENTIL, *Voyage dans les Mers de l'Inde*, Vol. I. p. 240—5. In the common notes of an almanac, published at *Calcutta*, by Mr. REUBEN BUR-



Now, the year 1784 is made to correspond with the years 48 and 49 (or *Anund* and *Rakhsa*) of the cycle of sixty, which appears to have the sanction of a Preface to the Benares *Pattra*, or calendar, of which a translation is given. Though reluctant to call such authority in question, I venture to assert, that the true Hindoo date should be 37 and 38, for the former and latter part of 1784. From among a variety of authorities concurring to establish this computation, I shall produce, in the first place, that of Belschius, the Author of a Grammar of the *Tamool* language (peculiar to that country in which the cycle is used), who has treated briefly, but with great accuracy, of chronology, and given the names of the 60 years in the original character, with the corresponding dates. M. LE GENTIL mentions having possessed himself of a copy of this work (printed at Tranquebar in 1738), and bringing it with him to Europe. ABRAHAM ROGER (whose book, entitled, in the French translation from the Dutch, *De la Vie et des Mœurs des Brames*, and printed at Amsterdam in 1670, contains much original information respecting the Hindoos) gives likewise the names of the sixty years; and says (p. 79.), that the year 1640, in the month of August, corresponded with *Wicrama*, the 14th of the cycle; consequently 1760 with the 14th also, and 1784 with the 38th. The communications of WALTHERUS, a learned missionary, published by BAYER under the title of *Doctrina temporum Indica*, are explicit as to this point. M. BAILLY, in his *Traité de l'Astronomie Indienne*, adopts in his calculations the date that I have assigned, and gives (p. 326.) the years of the cycle of sixty from P. DU CHAMP, in which 1724 (and consequently 1784) is remarked as corresponding with the 38th year. To this, if it were necessary, I might add the authority of a *Hindoo date* in the Asiatic Researches, before quoted, where the year *Pingala* (51) agrees with 939 of *Saca* or *Salabân*. The year 1 of the present cycle corresponded with 1669 of the era, according to the table I have given; and therefore 51 of the preceding cycle with 1659, from which deduct twelve whole cycles, or 720 years, and 939 remain; which, as the table was founded on other documents, will be allowed no weak corroboration, the date in question being from an ancient copper plate. I observe, with some concern, that I differ also from Mr. BURROW, both in the year of *Bikramajit* and that of *Salabân*. He makes the interval between them 136 years, whereas, by the authorities I have followed, it should be only 134, or 56 years before Christ, and 78 after. I should certainly not be forward to point out these apparent inaccuracies but from an apprehension, were I to pass them unnoticed, that my own computations might be condemned on an appeal to those of Mr. BURROW's almanac as a criterion. I have not seen any subsequent to that for 1784, which was the first.

(v) On reference to the *Ayzen Akbery*, or Institutes of the emperor *Akbar*, I find mention made (Vol. I. p. 344.) of an era established by him, being that of the commencement of his reign, in the year of Christ 1556. Although nothing is said of the conformity of its date with the current year of the *Hejra*, yet it is probable that this was the origin of what has since been called the Bengal era.

In the province of *Behar*, and some other parts of the empire, a year was established with a view to the revenue solely, called the *Fussullee* year. It appears to begin, and to take its date, from the month of September preceding the commencement of the common Bengal year, and therefore 1198 should begin in September 1790. Mention is made (in the *Alph. Grandonico-Malabaricum*, Romæ, 1772) of an era employed in the southern extremity of the peninsula, of which 965 should correspond with the year of Christ 1790.

(w) Mem. Acad. des Sciences, Tom. VIII. p. 218. *Traité de l'Astronomie Ind.* p. 18. and 21.

(x) This agrees with the Hindoo year given in the *Soorya Seedhanta*, and differs 6'' from that by M. LE GENTIL. These small differences arise probably from the forms of calculation, and are not fundamental.

(y) The cycle of the Chinese and Tartars comprehends 60 years, expressed by an artificial arrangement of 10 words or particles, prefixed to the names of 12 animals, in such a manner that 6 repetitions of the former coincide with 5 repetitions of the latter, and bring them to the same relative situation at the recommencement of the cycle.

(z) LOUBERE, Relation of Siam, Eng. transf. 1693, p. 169. et 202. Journal du Voyage de Siam, par M. L. D. C., Par. 1687, p. 286. Histoire Nat. et Pol. du Royaume de Siam, par N. Gervaise, Par. 1688, p. 154, 155.

